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BEFORE THE  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, D.C. 20554

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In the Matter of

Amendment of the Commission's Rules to  
Establish Rules and Policies Pertaining  
To a Mobile-Satellite Service in the  
1610-1626.5/2483.5-2500 MHz  
Frequency Bands

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CC Docket No. 92-166

RELY COMMENTS

OF

CONSTELLATION COMMUNICATIONS, INC.

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## Executive Summary

In its initial Comments in this proceeding, Constellation Communications, Inc. ("Constellation") generally supported the Commission's proposed approach to resolve the difficult issues inherent in licensing low-Earth orbit ("LEO") satellite systems in the 1610-1626.5 MHz and 2483.5-2500 MHz bands. The other four LEO applicants, Ellipsat, Loral/Qualcomm, Motorola and TRW expressed similar support for the Commission's proposals.

The initial comments clearly demonstrate that these bands should be reserved for LEO systems. Although AMSC seeks access to these bands, the Commission must firmly exclude AMSC. The record compiled in this proceeding clearly demonstrates the tangible benefits LEO technology will offer the American people and this country's economy. As global systems, the benefits of licensing new LEO technology will far outweigh any conceivable benefits of more geostationary satellites like the ones AMSC has yet to launch. Moreover, as the exclusive U.S. licensee in nearby bands allocated to the mobile-satellite service ("MSS"), AMSC has no need for additional spectrum at this time, particularly since its first launch is still at least nine months away. Assigning spectrum in the 1610-1626.5 MHz or 2483.5-2500 MHz bands to AMSC would only complicate and delay the development of a competitive MSS market in this country.

Although the Commission's proposals provide a useful framework for the resolution of this proceeding, the Commission can not resolve the mutual exclusivity between the five LEO applicants by imposing its proposed solution on the LEO applicants. Constellation has been meeting with the other LEO applicants

seeking an overall settlement and believes one will be eventually achieved.

Nevertheless, a number of changes to the Commission's proposed rules are necessary before a viable 1.6/2.4 GHz MSS can be implemented.

At L-band, the Glonass problem must be resolved in a manner that imposes no operational restrictions on MSS. Progress is being made in this area and the Commission must take a strong stance to insure a final satisfactory resolution. At S-band, the CDMA systems must be afforded access to the full band, and inter-system coordination must make full use of frequency and polarization planning to reduce satellite costs.

With respect to the proposed qualification standards, several minor modifications are necessary to the technical and financial requirements to remove unnecessary risks to the development of these new LEO MSS systems. In addition, the Commission must revise its proposed inter-service sharing rules to remove the burdens being placed on MSS in reaching coordination agreements with other services. Similar improvements are also proposed with respect to service rules governing blanket system licenses, milestones, in-orbit spares, replacement satellites, and other licensing provisions.

Finally, the feeder link issue requires resolution before any LEO MSS licenses can be issued. Prompt action is needed by the Commission to identify feeder link bands below 15 GHz if the system architecture of Constellation and the

other two LEO applicants proposing C-band feeder links are to be maintained. Otherwise, only Ka-band frequencies are available at substantial cost to the applicants, and new provisions beyond those contemplated in the Commission's Notice are needed to insure fair access to Ka-Band frequencies by all LEO applicants.

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**REPLY COMMENTS**

Constellation Communications, Inc. ("Constellation"), by its attorneys, files these Reply Comments in response to the Comments filed on May 5, 1994 on the Commission's Notice of Proposed Rulemaking, FCC 94-11, Released February 18, 1994, ("Notice") in the above-captioned matter.

**I.     Introduction**

Constellation is one of the five companies who filed applications for a low-Earth orbit ("LEO") satellite system in the 1610-1626.5 MHz and 2483.5-2500 MHz bands by the June 3, 1991 cut-off date.<sup>1</sup> Constellation also participated as a member of the Commission's Negotiated Rule Making ("NRM") Advisory Committee whose April 6, 1994 Final Report formed the basis for many of the Commission's proposals in the Notice.

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<sup>1</sup> See Application File Nos. 17-DSS-P-91(48) and CSS-91-013. Constellation also filed a Petition For Rule Making to establish service rules governing non-geostationary satellites in these bands which was assigned File No. RM-7771.

In its initial Comments,<sup>2</sup> Constellation urged the Commission to utilize these proceedings to establish a fully competitive Mobile-Satellite Service ("MSS") industry in the United States characterized by a multiplicity of licensees and business plans. Just as this country has reaped the benefits of competition and deregulation in the domestic fixed-satellite industry, the Commission is in a position to create a similarly competitive domestic MSS industry to provide the mobile and personal communications that the public demands now and in the future. Moreover, the unique characteristics of the proposed LEO systems, as compared to systems using the geostationary satellite orbit ("GSO"), will allow the Commission's licensees to export these services globally to the benefit of United States as well as foreign consumers.

Constellation fully supported the Commission's proposal to limit the use of these bands to non-geostationary satellites. Constellation also argued that the existing, exclusive licensee of geostationary satellites in the conventional MSS L-band should be disqualified from also holding a license in the 1.6/2.4 GHz MSS in competition with the new entrants.

In its comments, Constellation generally supported the Commission's proposed frequency sharing plan. However, this plan will not resolve the question of mutual exclusivity unless all five applicants agree to it because it assigns the most desirable part of

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<sup>2</sup> See Comments of Constellation filed May 5, 1994.

the L-Band spectrum exclusively to one applicant to the detriment of the other four.<sup>3</sup> Absent a comparative hearing or some alternative selection scheme, the Commission can not simply deny Constellation's application to use the most desirable L-Band frequencies. Despite the preferred position afforded by the Commission's proposed plan to one of the LEO applicants to the detriment of the others, Constellation nevertheless stated its willingness to consider acceptance of the Commission's L-Band frequency assignment plan as a compromise provided that (1) if the 1610-1616 MHz is impaired due to GLONASS, a contingency plan is implemented that reduces each licensee's (including Motorola's) assigned bandwidth in an equitable manner; (2) the operational details of interference sharing by the code division multiple access ("CDMA") applicants with respect to the use of frequency and polarization plans to reduce satellite cost are coordinated to Constellation's satisfaction, and (3) the entire 2483.5-2500 MHz band is made available to CDMA licensees.

Constellation also stated that it was substantially concerned over the Commission's failure to make the 5150-5216 MHz band available for feeder links. While Constellation stated its intent to participate in the CC Docket 92-297 proceedings looking at the Ka-band for its feeder links, Constellation also described the adverse cost and operational penalties this will have on its system and urged the Commission to identify and make available

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<sup>3</sup> In this regard Constellation, since the initial comments were filed, has been meeting with the other non-geostationary applicants in this proceeding in an attempt to eliminate mutual exclusivity. It is Constellation's intention to work closely with these applicants to solve all disagreements so that mutual exclusivity can be eliminated, amendments filed, and the applications granted.

satisfactory feeder link spectrum below 15 GHz.

Constellation also expressed some concerns about the details of some of the other proposed rules and offered specific text amendments in Appendix A to its initial comments.

A review of the initial comments in response to the Notice indicates that there are large areas of agreement among the parties and that the Commission's proposals can form the basis of an overall settlement of this proceeding. However, there are a number of areas where some modification is needed in order to enhance the potential for LEO MSS technology to deliver innovative and economical services to the public. These areas include affirmation that the 1.6/2.4 GHz bands will be assigned only to new entrants operating LEO systems, minor adjustments to the L and S-band assignment plan, removal of onerous inter-service sharing rules, minor modifications of the qualification standards and service rules, and resolution of the feeder link issue. The following is a review of these issues.

**II. The Public Interest Would Be Best Served By Establishing A Multiple Entry LEO MSS Service In The 1610-1626.5 MHz and 2483.5-2500 MHz Bands**

In its Notice, the Commission proposes to limit use of the 1.6/2.4 GHz MSS bands to LEO satellite systems.<sup>4</sup> The Commission listed a large number of factors which clearly demonstrate how the public interest will be served by the introduction of LEO technology

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<sup>4</sup> It is clear that the Commission has the legal authority to limit the use of the 1.6/2.4 GHz bands to LEO satellites. (See e.g., Comments of TRW at 13-15, Comments of LQP at 28-29, Comments of Motorola at 28-30).

by multiple system operators. In order to achieve these benefits and establish a competitive MSS market in the United States, it is also necessary to preclude expansion by the existing U.S. MSS GSO licensee into the 1.6/2.4 GHz MSS bands.

A. Substantial Public Benefits Will Be Provided By LEO Satellite Systems Operating In The 1.6/2.4 GHz Bands

The five LEO applicants, comprised of Constellation, Ellipsat Corporation ("Ellipsat"), Loral/Qualcomm Partnership, L.P. ("LQP"), Motorola Satellite Communications, Inc. ("Motorola") and TRW, Inc. ("TRW"), have provided additional information that further strengthens the rationale for the Commission's proposal to limit the 1.6/2.4 GHz MSS bands to LEO systems.<sup>5</sup> These benefits can be categorized as technical, service and economic.<sup>6</sup>

Technical Benefits. As a practical matter, mobile communications using non-directional antennas can be provided at lower transmit powers by LEO systems than GSO systems. This feature of LEO MSS systems allows the provision of service to handheld user terminals. On the other hand, existing and currently planned GSO systems

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<sup>5</sup> See e.g. Comments of Constellation at 5-12, Comments of Ellipsat at 17-20, Comments of LQP at 11-15, Comments of Motorola at 2-16 and 21-24, and Comments of TRW at 3-5 and 15-25.

<sup>6</sup> Motorola argues that LEO MSS is entitled to special consideration as an emerging technology. See Comments of Motorola at 24-25. Constellation agrees. It should be noted that while AMSC claims that GSO MSS technology is well proven, AMSC has yet to launch a satellite and it is evidently experiencing technical problems with its spacecraft antennas that are causing delays to its launch schedule. See note 16 infra.

are limited to suitcase/vehicle-type terminals. Additionally, inherent in LEO system technology is the significantly lower transmission path delay compared to that provided over GSO systems.<sup>7</sup> Equally important, LEO systems are inherently global in coverage (see discussion in Section IV.A below) while GSO systems are regional at best. Finally, LEO systems provide more efficient spectrum utilization by higher frequency re-use.<sup>8</sup>

Service and Social Benefits. LEO systems support global, seamless roaming as part of a single worldwide communications network. As ubiquitous extensions of ground-based mobile radio systems, LEO satellites provide international accessibility. This can not be provided through terrestrial mobile systems or GSO MSS. LEO systems also support global position location and asset management. LEO systems will provide low cost telecommunication infrastructure to people in rural and remote areas not currently served by terrestrial systems. Although these infrastructure capabilities are most apparent in developing countries, there are at least 7 million people in the USA alone that will benefit from LEO system availability. Finally, LEO systems can become an indispensable consumer product for tens of millions of international travellers and can provide wide area disaster and emergency service. Diplomats and businessmen will be able to maintain communications whether they are in New York City or the middle of the Gobi desert.

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<sup>7</sup> The radio propagation time delay is on the order of 10-30 ms for a LEO system and 230-280 ms for a GSO system. An additional voice processing delay on the order of 80-100 ms can be added to both types of systems for low data rate (e.g. 4,800 kbps) voice transmissions.

<sup>8</sup> See also Comments of Motorola at 21-24.

Economic Benefits. The introduction of LEO technology will have a tremendous impact on U.S. trade and industry. For instance, foreign revenues from LEO system license fees, leases, technical assistance, royalties will be beneficial to the U.S. economy. The export of computers, terminals, displays, software, antennas, and transmission equipment will have a positive impact on the U.S. balance of trade. Moreover, LEO systems provide the U.S. the ability to take on the unassailable lead in this new telecommunications technology and service. According to Motorola, LEO technology will infuse \$6.7 billion into the U.S. economy and create 241,000 jobs by 2002.<sup>9</sup>

In sum, LEO MSS technology provides a tremendous opportunity for U.S. businesses to create economic opportunity at home and abroad. This opportunity can spread from the U.S. electrical engineers, to the U.S. manufacturers of spacecraft, to the U.S. producers of integrated circuits, to U.S. builders of transceivers, to U.S. telecommunication services providers, to international businessmen and to farmers in the remote areas of the Amazon. There can be no doubt that if LEO MSS reaches its full potential, its benefits will spread throughout our economy and throughout the world.

B. AMSC's Application Is Neither A Practical Nor Realistic Proposal For Use Of The 1.6/2.4 GHz Bands

The only party objecting to the Commission's proposal to limit use of the 1.6/2.4 GHz MSS bands to LEO systems is AMSC Subsidiary Corporation ("AMSC"). However,

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<sup>9</sup> See Comments of Motorola at 11.

AMSC fails to provide empirical information to support its claims that: (i) non-GSO systems are unreliable, (ii) non-GSO systems can not be financed, (iii) non-GSO system have unresolvable inter-service sharing problems, (iv) non-GSO systems can not operate with proposed foreign systems, or (v) non-GSO systems have a high risk of in-orbit collisions.<sup>10</sup> Indeed, if there is any basis to apply these claims to LEO systems, it is probable that a stronger case exists against GSO systems.

The technical claims<sup>11</sup> made by AMSC that GSO systems have substantial advantages over non-GSO systems are incorrect. AMSC's claim that GSO MSS systems are better than LEO systems is based on a single, unrealistic GSO design concept.<sup>12</sup> The GSO concept cited by AMSC exists only on paper. The large unfurlable antenna needed to create from GSO the same size spot beams provided by simpler antennas on LEO satellites is a very high risk technology, particularly for a commercial venture.<sup>13</sup> Moreover, system costs would have to be at least doubled, to a total space segment investment comparable to the Iridium system, since in-orbit space satellites would have to be maintained in orbit to assure satisfactory circuit availability in the event of a satellite failure. AMSC's claims that

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<sup>10</sup> See Comments of AMSC at 7.

<sup>11</sup> See Comments of AMSC at 19-34, Technical Appendix and Exhibit B.

<sup>12</sup> See Comments of AMSC at Exhibit B.

<sup>13</sup> The extremely high risk associated with such an antenna design is illustrated by the problems being experienced by AMSC with the much simpler antenna design of its first satellites. See note 16 *infra*.

LEO satellites waste spectrum resources and satellite power are incorrect because LEO satellite systems will utilize load management to match power and spectrum usage to actual traffic levels. AMSC's reference to dispatch service as an advantage of GSO is overstated and inconsistent with the spectrum efficiency claims for GSO satellites. A separate channel must be used in each satellite beam for dispatch; and if a single large (e.g. continental coverage) beam is used for an efficient dispatch service, then the spectrum efficiency of the satellite is low because there is no frequency reuse within the large, single beam dispatch area. Finally, AMSC's litany of LEO system deficiencies is based solely on invalid claims contained in its earlier filings on the individual system applications. All of these assertions have already been rebutted by the LEO applicants in their responses to AMSC's earlier filings and the Commission should ignore AMSC's attempts to regurgitate those invalid claims in this proceeding.

Furthermore, AMSC is simply incorrect in its assertions that non-GSO systems will not comply with proposed technical and coverage standards.<sup>14</sup> LEO systems with their higher average elevation angles over mid-latitude regions are better able than GSO systems to provide reliable, continuous service. One of the advantages of LEO satellites is that they are not subject to frequent and prolonged outages due to low elevation angles and obstructions that can be experienced with GSO systems. Similarly, AMSC's references to unresolved issues that prevent sharing of the bands 1.6 and 2.4 GHz bands are without

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<sup>14</sup> Appendix A to these Reply Comments demonstrates that there are a variety of orbital constellations that satisfy the Commission's proposed requirements.

merit. As demonstrated in the initial comments, there are no insurmountable sharing problems in these bands.<sup>15</sup> Finally, AMSC's concerns with orbital collisions are overstated since each LEO MSS system will operate at a different altitude to avoid such collisions, and appropriate steps will be taken at the end of a satellite's operational lifetime to protect the replacement satellites.

AMSC characterizes its proposal as "the most practical and realistic proposal of any of the applicants." However, AMSC has had over six years since it was formed as the sole licensee of a domestic MSS system in the United States to construct, launch and operate its system. The launch of its first satellite is still at least nine months away.<sup>16</sup> Thus, AMSC is in no position to question the capabilities of the current LEO MSS applicants to promptly implement their proposed systems.

There is no reason to believe, and AMSC has not made any factual showing, that adding the 1.6/2.4 GHz bands to the AMSC system will allow it to provide any new or more economical services than it is already planning in the bands for which it holds the exclusive United States license. With no AMSC satellite in service, and no regular mobile telephone traffic base, AMSC is incapable of demonstrating that it can fill up the "thousands" of channels available on its current system design. AMSC asserts that cannot meet its demand with 20 MHz of exclusive L-band spectrum in the conventional MSS L-

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<sup>15</sup> AMSC's arguments based on sharing difficulties are incongruous since it would face the same sharing problems if it were permitted to operate in these bands as the LEO systems.

<sup>16</sup> See Communications Daily, June 14, 1994 at 7. The launch of the first AMSC satellite was recently delayed because of problems with the spacecraft antenna.

band spectrum.<sup>17</sup> Yet it provides no technical basis for the Commission to conclude that allowing AMSC access to the 1.6/2.4 GHz band on a shared basis with five other systems will solve this problem. Indeed, if AMSC expects to achieve a significant capacity increase by adding the 1.6/2.4 GHz MSS bands to its system on a shared basis, there is something seriously wrong with its system design that uses 20 MHz of spectrum on an exclusive basis.

AMSC claims that its proposal for the 1.6/2.4 GHz MSS bands will have minimal impact on the plans of the non-GSO system applicants. But the fact is that there will be loss of capacity to the other operators if AMSC is allowed to operate in the 1.6/2.4 GHz bands. Additionally, AMSC has not provided a detailed explanation of how it would integrate the new bands into its system. In the absence of demonstrated needs based on actual service being provided, the recent experience with AMSC indicates a very real danger of spectrum warehousing and blocking competitors if AMSC's request for additional spectrum in the 1.6/2.4 GHz bands is granted.

AMSC's GSO system is currently designed to provide service only in the United States, with the capability of providing service in neighboring countries. However, it indicates that it

... expects to be a major part of bringing Mobile Satellite Service to the world, through the development of technology and marketing experience and the establishment of a solid business, and perhaps in the long-term through participating in the provision of service in other regions.<sup>18</sup>

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<sup>17</sup> See Comments of AMSC at 6.

<sup>18</sup> See Comments of AMSC at 20.

However, the inherent advantage of LEO systems is that they can provide global service from the outset. There is no reason for the Commission to wait to see if AMSC's vision is viable when there are five applicants now prepared to provide global MSS service. Following the incremental AMSC plan would merely result in keeping the U.S. out of a world leadership role in MSS technology and markets. The LEO MSS systems will insure U.S. MSS leadership by providing better service, at lower cost, on a truly integrated global basis.

### III. The Differences Between The Pending LEO Applicants On The Commission's Proposed Assignment Plan Can Be Resolved

In its initial comments, Constellation expressed its disappointment with the preferential treatment afforded to Motorola by the Commission in developing its L-Band assignment plan. Nevertheless, Constellation expressed its desire to work within the compromise framework of the Commission's proposal to achieve an overall settlement of this proceeding and the prompt issuance of licenses to all five of the LEO applicants.<sup>19</sup> The other four LEO applicants have also indicated their acceptance of the Commission's proposal as a framework for resolving this proceeding.<sup>20</sup> Although each of the LEO applicants, including Constellation, have

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<sup>19</sup> Although this section deals with the assignment of frequencies for the MSS service links, it must be emphasized that no MSS system licensees can be issued until the feeder link issues are resolved. See Section VIII below.

<sup>20</sup> See e.g. Comments of Ellipsat at 13, Comments of LQP at 3-7, Comments of Motorola at 34, Comments of TRW at 47. LQP indicates that its meetings with the other applicants has produced progress towards prompt resolution of proceeding. See Comments of LQP at 3-4. Constellation has participated in

indicated that some modification of the Commission's proposal is necessary, Constellation believes that all of the issues surrounding the L/S-Band frequency assignment plan can be resolved in a satisfactory manner that would allow the Commission to issue licenses to all qualified LEO applicants.<sup>21</sup>

A. All Eligible Applicants Must Agree To A Settlement If Mutual Exclusivity Is To Be Eliminated In This Proceeding

Absent a settlement among the LEO applicants, Constellation believes that the Commission must adopt rules of general applicability and must allow applicants to select the transmission and multiple access method most appropriate to their business plan. Constellation believes that the basic issue here is not so much the question of modulation or multiple access method,<sup>22</sup> as it is the question of whether a system is assigned a narrow band of spectrum to be used by itself or whether a system shares a wider band of spectrum with a number of other systems. Although Constellation has indicated its willingness to operate as a CDMA system in order to

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those meetings and will continue to do so.

<sup>21</sup> Mobile Datacom Corporation ("MDC") filed comments proposing that the CDMA segment be centered at 1618.25 MHz in order to allow wideband radiodetermination-satellite service ("RDSS") to utilize CDMA LEO satellites in the future. Specifically, MDC proposes that the CDMA segment be in the center of the band with two 2.575 MHz segments at the top and bottom assigned to Motorola. Constellation believes that there is technical merit in MDC's proposal. However, Constellation does not believe it desirable to undercut the progress being made by the LEO applicants to resolve this proceeding by introducing an additional requirement on the settlement that is not directly related to the services being proposed by the five current LEO applicants.

<sup>22</sup> Constellation agrees with TRW that a change in transmission technique should not be treated as a major amendment. See Comments of TRW at 71.

reach a settlement in this proceeding, the Commission can not impose upon Constellation full band interference sharing within the 11.35 MHz L-band segment if it continues to allow Motorola the option of an exclusive frequency assignment.

As demonstrated in Constellation's initial comments, full band interference sharing does impose a significant weight and power cost that can be mitigated, particularly at S-band, by choosing frequency and polarization plans that minimize the amount of code noise from other systems within a particular band segment. While the Commission may by rule require all five LEO MSS applicants to use CDMA,<sup>23</sup> it can not by rule require four LEO MSS applicants to use CDMA on an interference sharing basis and allow the remaining applicant to have exclusive use of its own band segment. All five LEO MSS applicants must have equal options available to them to use the spectral resource.

Motorola indicates in its comments that the proposed sharing plan is "the type of 'workable adjustments' that avoids mutual exclusivity and that the Commission may impose without a hearing."<sup>24</sup> It is hard to understand the logic of this statement. Constellation agrees that the Commission has authority to develop generic technical or operational rules and policies that are applicable to all applicants on an equitable basis, such as a requirement that systems in these bands operate in

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<sup>23</sup> See Second Report and Order in Gen Docket No. 84-689 104 FCC 2d 650 (1986).

<sup>24</sup> See Comments of Motorola at 38.

low-Earth orbit. However, each of the applicants has requested specific frequencies with specific operating parameters. In Constellation's case its presently pending application requested an exclusive assignment of the 1624.5-1626.5 MHz band. Absent a settlement, it is hard to see how the Commission can provide Motorola exclusive access to one portion of the band while requiring Constellation to share with the other applicants.<sup>25</sup> Additionally, it is difficult to understand how the Commission can assign one applicant significantly superior spectrum while another applicant is assigned impaired spectrum. A review of all the comments in this proceeding makes it abundantly clear that the entire L-Band spectrum is not equal. Hundreds of pages of comments were submitted by all the applicants discussing the different impairments in the band. It can not be disputed that the top part of L-band is substantially superior to the bottom part of L-band.<sup>26</sup>

The decision making authority that would be required to provide one applicant exclusive use of spectrum while requiring another applicant to share spectrum, or to assign one applicant the prime spectrum while another applicant is assigned impaired spectrum, is the very type of situation that the doctrine of mutual

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<sup>25</sup> Constellation has indicated an intention to amend its application so it can operate as a CDMA system. Its plan is to only make such an amendment subsequent to the conclusion of an overall binding settlement among the five LEO applicants. Constellation has indicated in its initial Comments and these Reply Comments that certain changes must be made to the Commission's proposals before it can agree to participate in a settlement of this proceeding.

<sup>26</sup> The top part of the band assigned to Motorola does not have the interservice sharing problems that arise in the bottom 6 MHz in the band. This lower part of the band must contend with radio astronomy and Glonass.

exclusivity developed in Ashbacker<sup>27</sup> was trying to avoid. There have been no legal arguments developed in this proceeding that refute this conclusion. Thus, the only way to avoid mutual exclusivity is for the five LEO applicants to reach an agreement on how to share the band and then amend their pending applications to conform to such an agreement.

B. The CDMA Systems Must Be Provided Access To The Entire 2483.5-2500 MHz Downlink Band

In its Notice, the Commission proposed to "to authorize the CDMA operators to share the same amount of downlink spectrum as uplink spectrum"<sup>28</sup> even though a total of 16.5 MHz is allocated for LEO downlinks. The only apparent rationale offered for this proposal is that the frequency division multiple access/time division multiple access ("FDMA/TDMA") system does not need S-band downlink spectrum and that the Commission "may decide to avoid licensing in those portions of the 2.4 GHz band that are especially susceptible to inter-service interference."<sup>29</sup>

All of the CDMA LEO applicants objected to this proposal to limit the amount of usable S-band downlink spectrum to less than the total 16.5 MHz

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<sup>27</sup> Ashbacker Radio Corporation v. FCC, 326 U.S. 327, 66 S. Ct. 148, 90 L. Ed. 108 (1945).

<sup>28</sup> Notice at para. 37 and n. 69.

<sup>29</sup> Id., and n. 70.

bandwidth allocated to downlinks.<sup>30</sup> In particular, TRW noted that there is no technical reason to require the same amount of uplink and downlink spectrum to be used by CDMA systems, particularly when the availability of additional S-band spectrum will allow flexibility to locate operating frequencies. In its extensive technical exhibits, LQP demonstrates that there are no serious S-band inter-service sharing problems that would warrant limiting the amount of S-band spectrum available to CDMA systems. Thus, there does not appear to be any technical basis for the proposed reduction of assigned S-band spectrum below the 16.5 MHz allocated to MSS.

Constellation is particularly concerned by the Commission's proposal. As demonstrated in its initial comments, interference sharing by CDMA systems imposes significant costs in terms of satellite prime power and weight.<sup>31</sup> This impact can be substantially ameliorated by coordinating frequency plans and polarizations so that all four systems are not simultaneously using the same frequencies. With 16.5 MHz at S-band and 11.35 MHz at L-band, Constellation has shown that coordination may allow CDMA system operators to reduce the overall

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<sup>30</sup> See, e.g. Comments of Constellation at 28-29, Comments of Ellipsat at ii and 26-27, Comments of LPQ at 5, 31-36 and Technical Appendix, and Comments of TRW at 82-83 and n. 130.

<sup>31</sup> See Comments of Constellation at Appendix B.

cost impact on their systems.<sup>32</sup> Thus, a critical element to the success of the Commission's band sharing proposal is the assignment of the entire 16.5 MHz at S-band to the CDMA systems.

C. The Commission Must Resolve Critical Related Issues Involving Inter-Service Sharing and Feeder Links As Part of Its L-Band Plan

In its Notice, the Commission has focused on the difficult issues involved in assigning L-band spectrum to the five LEO MSS systems. While the LEO applicants may be converging on the Commission's L-band proposal as a framework of a settlement, there are at least two other critical areas that must be resolved by the Commission in order to make such a settlement viable. The first issue is Glonass. The apportionment of the 16.5 MHz of L-band spectrum into 11.35 MHz for four CDMA systems and 5.15 MHz for one FDMA/TDMA system is critically dependent on there being no operational impairment on CDMA systems imposed by the Commission to protect Glonass operations.<sup>33</sup> The second issue is the availability of appropriate feeder link spectrum without which a LEO MSS system

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<sup>32</sup> A related issue is the proposal to increase S-band power flux density ("PFD") to increase CDMA system capacity. TRW supports a 6 dB increase. (See Comments of TRW at 131.) LQP proposes to increase the S-band PFD limit to -136/-149 dBW/m<sup>2</sup>-4 kHz for 25°/5° elevation angles and linear interpolation between these elevation angles. (See Comments of LQP at 73-78.) While Constellation supports an increase in the per satellite S-band PFD limit specified to protect terrestrial services, the operating PFDs produced by interference sharing MSS satellites must be coordinated by the CDMA LEO system operators to the same aggregate system value based on current system designs.

<sup>33</sup> See Section V.B below for a detailed discussion of this issue.